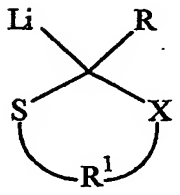
CLAIMS

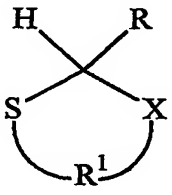
What is claimed is:

1. An sulfur containing anionic polymerization initiator that is defined by the formula



where R is selected from C_1 to C_6 trialkyl-silyl groups, C_1 to C_{20} alkyl groups, C_4 to C_{20} cycloalkyl groups, C_6 to C_{20} aryl groups, thienyl, furyl, and pyridyl groups; and R may optionally have attached thereto any of following functional groups: C_1 to C_{10} alkyl groups, C_6 to C_{20} aryl groups, C_2 to C_{10} alkenyl groups, C_3 to C_{10} non-terminal alkynyl groups, ethers, *tert*-amines, oxazolines, thiazolines, phosphines, sulfides, silyls, and mixtures thereof; where R^1 is selected from C_2 to C_8 alkylene groups and where X is selected from S, O and NR and wherein R is as defined above, and may optionally have attached thereto any of the above identified functional groups.

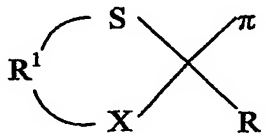
2. A method for preparing an anionic polymerization initiator comprising the step of reacting a sulfur-containing initiator precursor with an organometallic compound, wherein the precurson is defined by the following formula:



where R is selected from C_1 to C_6 trialkyl-silyl groups, C_1 to C_{20} alkyl groups, C_4 to C_{20} cycloalkyl groups, C_6 to C_{20} aryl groups, thienyl, furyl, and pyridyl

groups; and R may optionally have attached thereto any of following functional groups: C_1 to C_{10} alkyl groups, C_6 to C_{20} aryl groups, C_2 to C_{10} alkenyl groups, C_3 to C_{10} non-terminal alkynyl groups, ethers, *tert*-amines, oxazolines, thiazolines, phosphines, sulfides, silyls, and mixtures thereof; where R^1 is selected from C_2 to C_8 alkylene groups, where X is selected from S, O and NR and wherein R is as defined above, and may optionally have attached thereto any of the above identified functional groups.

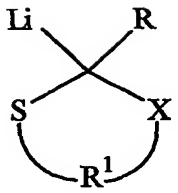
3. A functional polymer that is defined by the following formula



where R is selected from C_1 to C_6 trialkyl-silyl groups, C_1 to C_{20} alkyl groups, C_4 to C_{20} cycloalkyl groups, C_6 to C_{20} aryl groups, thienyl, furyl, and pyridyl groups; and R may optionally have attached thereto any of following functional groups: C_1 to C_{10} alkyl groups, C_6 to C_{20} aryl groups, C_2 to C_{10} alkenyl groups, C_3 to C_{10} non-terminal alkynyl groups, ethers, tert-amines, oxazolines, thiazolines, phosphines, sulfides, silyls, and mixtures thereof; where R^1 is selected from C_2 to C_8 alkylene groups, where X is selected from S, O and NR, where R is as defined above, and may optionally have attached thereto any of the above identified functional groups and where π is a polymer chain.

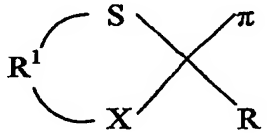
4. A method for preparing a functional polymer, the method comprising:

initiating a living polymer chain with a sulfur containing initiator, where the initiator is defined by the formula



where R is selected from C_1 to C_6 trialkyl-silyl groups, C_1 to C_{20} alkyl groups, C_4 to C_{20} cycloalkyl groups, C_6 to C_{20} aryl groups, thienyl, furyl, and pyridyl groups; and R may optionally have attached thereto any of following functional groups: C_1 to C_{10} alkyl groups, C_6 to C_{20} aryl groups, C_2 to C_{10} alkenyl groups, C_3 to C_{10} alkynyl groups, ethers, tert-amines, oxazolines, thiazolines, phosphines, sulfides, silyls, and mixtures thereof; where R^1 is selected from C_2 to C_8 alkylene groups, where X is selected from S, O and NR and wherein R is as defined above, and may optionally have attached thereto any of the above identified functional groups.

5. A vulcanized rubber composition comprising at least one vulcanizable rubber and a filler, where the at least one vulcanizable rubber is a functional polymer that is defined by the formula



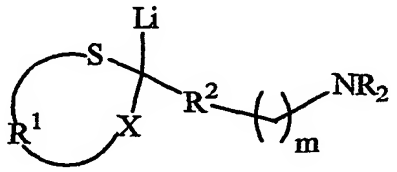
where R is selected from C_1 to C_6 trialkyl-silyl groups, C_1 to C_{20} alkyl groups, C_4 to C_{20} cycloalkyl groups, C_6 to C_{20} aryl groups, thienyl, furyl, and pyridyl groups; and R may optionally have attached thereto any of following functional groups: C_1 to C_{10} alkyl groups, C_6 to C_{20} aryl groups, C_2 to C_{10} alkenyl groups, C_3 to C_{10} non-terminal alkynyl groups, ethers, tert-amines, oxazolines, thiazolines, phosphines, sulfides, silyls, and mixtures thereof; where R^1 is selected from C_2 to C_8 alkylene groups, where X is selected from S, O and NR where R is as defined above, and may optionally have attached

thereto any of the above identified functional groups, and where π is a polymer chain.

6. The composition of claim 5 wherein the filler comprises carbon black, silica, starch, aluminum hydroxide, magnesium hydroxide, clays (hydrated aluminum silicates), and mixtures thereof.

7. A tire component comprising the rubber composition of claims 5 or 6.

8. The initiator of claim 1, further defined by the following formula:



where R^2 is selected from the group consisting of C_1 to C_8 alkylene groups, C_3 to C_{12} cycloalkylene groups and C_6 to C_{18} arylene groups and m is 0 to about 8.

9. The initiator of claims 1 or 8, or the method of claims 2 or 4, wherein the initiator is selected from 2-lithio-2-methyl-1,3-dithiane, 2-lithio-2-phenyl-1,3-dithiane, 2-lithio-2-(4-dimethylamino)phenyl-1,3-dithiane, 2-lithio-2-trimethylsilyl-1,3-dithiane and 2-lithio-2-phenyl-1,3-oxathiane.

10. The method of claim 4 wherein the living polymer chain is selected from conjugated dienes having from about 4 to about 12 carbon atoms and monovinyl aromatic monomers having 8 to 18 carbon atoms and trienes and mixtures thereof.

11. The method of claim 4 further comprising the steps of:

providing a reaction medium;

adding a monomer or monomers to be polymerized to said reaction medium; and

adding the initiator to said reaction medium.

12. The methods of claims 4, 10 or 11, further comprising the step of:

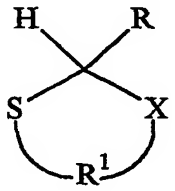
terminating the living polymer chain with a terminating agent, coupling agent, or linking agent.

13. A method for anionically polymerizing monomers comprising the steps of:

synthesizing a sulfur containing anionic initiator in the presence of monomer from a precursor and an organolithium compound;

polymerizing said monomers with said sulfur containing anionic initiator to provide a functional head group on the polymer.

14. The method of claim 13, wherein said precursor is selected from sulfur containing lithio compounds having the general formula

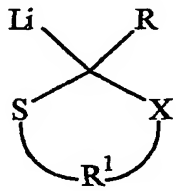


where R is selected from C_1 to C_6 trialkyl-silyl groups, C_1 to C_{20} alkyl groups, C_4 to C_{20} cycloalkyl groups, C_6 to C_{20} aryl groups, thienyl, furyl, and pyridyl groups; and R may optionally have attached thereto any of following functional groups: C_1 to C_{10} alkyl groups, C_6 to C_{20} aryl groups, C_2 to C_{10} alkenyl groups, C_3 to C_{10} non-terminal alkynyl groups, ethers, *tert*-amines, oxazolines, thiazolines, phosphines, sulfides, silyls, and mixtures thereof; where R^1 is selected from the group consisting of C_2 to C_8 alkylene groups and where X is selected from the group consisting of S, O and NR, wherein R is as defined above, and may optionally have attached thereto any of the above identified functional groups.

15. A method for anionically polymerizing monomers comprising the step of:

polymerizing said monomers with a sulfur containing anionic initiator to provide a functional head group on the polymer.

16. The method of claim 15, wherein said sulfur containing anionic initiator is selected from the group consisting of sulfur containing lithio compounds having the general formula



where R is selected from C_1 to C_6 trialkyl-silyl groups, C_1 to C_{20} alkyl groups, C_4 to C_{20} cycloalkyl groups, C_6 to C_{20} aryl groups, thienyl, furyl, and pyridyl groups; and R may optionally have attached thereto any of following functional groups: C_1 to C_{10} alkyl groups, C_6 to C_{20} aryl groups, C_2 to C_{10} alkenyl groups, C_3 to C_{10} non-terminal alkynyl groups, ethers, tert-amines, oxazolines, thiazolines, phosphines, sulfides, silyls, and mixtures thereof; where R^1 is selected from C_2 to C_8 alkylene groups, where X is selected from S, O and NR, where R is as defined above, and may optionally have attached thereto any of the above identified functional groups.

17. The functional polymer resulting from the method of claims 15 or 16.